Baseline Characteristics, Evaluation, and Management of Women With Complaints of Recurrent Urinary Tract Infections

Developed by the AUGS Junior Faculty Research Network

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Objective: The aims of this study were to determine the proportion of women presenting for recurrent urinary tract infections (UTIs) who met the diagnostic criteria (culture-proven UTI ≥3 in 1 year or ≥2 in 6 months) and to assess advanced testing utilization, preventive therapy use, and risk factors.

Methods: This is a retrospective chart review of women seen as new urogynecology consults for recurrent UTI (rUTI) between April 1, 2017, and April 1, 2018, followed through April 1, 2019. Exclusion criteria included catheter use, cancer treatment within 2 years, and prior organ transplant, urinary diversion, conduit, or bladder augmentation.

Results: Of 600 women, 71% had follow-up with a median of 179 days. Urinary tract infection symptoms included frequency (50%), dysuria (46%), urgency (43%), and malodorous urine (7%). One third met the rUTI diagnostic criteria. Two hundred thirty-four (39%) underwent advanced testing, and 9% (21/234) of women who underwent advanced testing had a change in clinical care. Preventive therapy use increased after consultation ($P < 0.001$), with vaginal estrogen (47%) being most common. Compared with women not meeting the rUTI criteria, women meeting the rUTI criteria were more likely to be older (adjusted odds ratio [aOR], 1.03/year; 95% confidence interval [CI], 1.02–1.04), have a prior history of gynecologic cancer (aOR, 4.07; 95% CI, 1.02–16.25), or report UTI symptoms of dysuria (aOR, 2.27; 95% CI, 1.57–3.27), or malodorous urine (aOR, 2.96; 95% CI, 1.47–5.94) and, while equally likely to be receiving preventive treatment prior to consultation, were more likely after consultation (OR, 3.06; 95% CI, 2.05–4.55).

Discussion: Thirty-seven percent of women seen for rUTI met the diagnostic criteria. Advanced imaging rarely changed care. Education about diagnostic criteria and preventive therapy is warranted.

Key Words: preventive therapy, urinary tract infections, urogynecology, UTI

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Urinary tract infections (UTIs) are a prevalent and bothersome condition. Approximately 20–44% of women who have had 1 episode of UTI will have recurrent UTI (rUTI).[1,2] Recurrent UTIs have a significant negative impact on quality of life and cause an economic burden.[3–5] Guidelines for the workup of women with rUTIs are not well established, and there are no universally accepted treatment protocols to guide clinical practice.[6] In the absence of high-quality evidence, there is significant variability in the evaluation and management of rUTI, with clinicians basing their strategies on anecdotal evidence or expert opinion from professional societies, although these can vary.[7–10]

In order to help direct clinicians and inform guidelines, we sought to describe the presentation and outcomes of women referred to tertiary urogynecology practices with complaints of rUTIs. We had 4 objectives: (1) determine the proportion of women with complaints of rUTI who had met the diagnostic criteria (≥3 culture-proven UTI in a year or ≥2 in 6 months), (2) characterize advanced testing utilization and outcomes, (3) assess prophylaxis prescribed before and after a urogynecology consult, and (4) identify risk factors for rUTI.

METHODS

This was a retrospective cohort study of women seen between April 1, 2017, and April 1, 2018, as a new patient consultation at any outpatient urogynecology clinic within the 5 academic institutions. Each individual site obtained local institutional review board approval before study initiation.

Women with referral, complaint, or diagnosis of recurrent or frequent UTI at their initial consultation visit were included. We chose this definition in order to most accurately model the patients seen for rUTI in a urogynecology practice, including women in whom rUTI was diagnosed by their referring health care providers, women suspected of having recurrent/frequent UTIs (with or without culture data), and women who reported having had 2 or more UTIs in the past 6 months or 3 or more UTIs in the past year. The patients were followed from their initial consultation through April 1, 2019, to provide a minimum 12-month follow-up during which the women would be at risk of UTI while under the care of the consultative urogynecologist.

At 4 sites, each chart of any new patient seen between April 1, 2017, and April 1, 2018, was individually reviewed to determine eligibility. We included any and all new patient visits in our initial screening regardless of reason for consultation or referral status, such that patients referred for UTI complaints as well as patients referred for any other reason (such as prolapse, incontinence, or self-referral) were all reviewed. Because of institutional review board restrictions, 1 site had its electronic data warehouse screen all new patient charts between April 1, 2017, and April 1, 2018, for patients who had a referral, chief complaint, or visit diagnosis of rUTI, frequent UTI, or chronic UTIs. Patients were excluded from the study if they met any of the following criteria: age younger than 18 years, chronic catheter use (including indwelling transurethral Foley

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catheter, suprapubic catheter, or intermittent self-catheterization), immunosuppression due to prior organ transplant, or prior urinary tract reconstructive surgery (including urinary diversion, conduit, or bladder augmentation). Patients were also excluded if they had had an active malignancy or treatment for malignancy within the 2 years before consultation visit, meaning that patients who had cancer/cancer treatment prior to that time would be eligible for inclusion, but anyone who had an active cancer or had undergone cancer treatment within the 2 years of her consultation visit was excluded.

From the initial visit documentation, baseline sociodemographic data were extracted. We also collected medical and surgical history, urogynecologic history (including lower urinary tract symptoms and current/prior treatment for overactive bladder and/or stress urinary incontinence [SUI]), as well as prior UTI treatment and evaluation (including UTI symptoms, prior workup, and current/past preventive treatments). The following criteria were used as diagnostic criteria for culture-proven rUTI: culture-proven UTI (>10,000 colony-forming units [CFU]) occurring 3 or more times in 1 year or 2 or more times in 6 months.[2] Cultures were considered positive if any single bacteria >10,000 CFU was noted on a catheterized specimen and >100,000 CFU was noted on a clean-catch specimen. Cultures were considered contaminated and were not counted as a UTI if more than 2 bacterial species were identified. Polymerase chain reaction urine testing was not widely utilized in the study population and was not recorded. Postvoid residual volume was recorded from the consultation visit or, if not available, from any point during follow-up (eg, subsequent clinic visit(s) or subsequent urodynamic evaluation). We also collected what, if any, preventive measures were reported/recorded as having been started prior to the initial consultation, those that were started at the time of initial consultation, or those started during follow-up. We defined starting a preventive therapy to include the starting of medications/supplement. A change in the dosage of the preventive therapy, such as an antibiotic or cranberry supplement dose alteration, was not counted as a new preventive therapy. Preventive therapy was aggregated into dichotomous yes/no outcome for each major type of prophylactic regimen, which we defined a priori by group consensus to include the following categories: daily prophylactic antibiotics, prophylactic antibiotics other than daily, postcoital antibiotics, vaginal estrogen, cranberry, probiotic, D-mannose, methenamine (Hiprex), and other preventive strategy (with details entered in text). For our analysis, we combined daily prophylactic antibiotics and prophylactic antibiotics other than daily into a single prophylactic antibiotics category.

From time of the initial consult through April 1, 2019, data on any UTI occurrence (including treatment, urine culture testing and results, bacterial species isolated, and resistance to initial UTI therapy) were collected by direct review of urine culture results, as well as urogynecology clinical notes showing UTI treatment, primary care provider/other health care provider notes indicating treatment for UTI, and patient report during follow-up visits of having had UTI treatment via an outside health care provider. We also recorded advanced testing (cystoscopy, X-ray, renal ultrasonography, computed tomography [CT], or magnetic resonance imaging), results of the test (normal or abnormal), and whether the results changed clinical care. Study data were collected and managed using REDCap (Research Electronic Data Capture) hosted at Northwestern University.[11,12]

To obtain UTI data to determine whether patients met the diagnostic criteria, as well as to determine UTI incidence during follow-up, we reviewed the clinical notes, as well as results within our medical system and any results we were able to obtain from outside health systems. In our practices, patients being followed for rUTI were routinely instructed to obtain urine testing through our practices/within our health care systems. If urine testing was not able to be obtained within our practices/health care systems, then patients were routinely instructed to have outside health care providers fax/submit results to our practice to enable us to record urine testing results and any UTI treatment. We also attempted to ensure we obtained outside results by routinely querying patients at follow-up visits regarding UTI testing and treatment.

IBM SPSS version 25 (Armonk, NY) with descriptive summary statistics was used to describe the entire cohort. The percentage of women who had subsequent UTI during follow-up was calculated, as well as the percentage who had different numbers of subsequent infections. In addition, we analyzed the differences in identified bacteria and antibiotics prescribed for the first UTI versus subsequent UTIs in follow-up.

Women meeting culture-proven rUTI criteria were compared with those who did not using t tests for continuous normally distributed data, and χ^2 test or Fisher exact test for categorical data. Univariable and multivariable logistic regression was used to determine risk factors for culture-proven rUTI. Any variables with $P < 0.2$ on univariable analysis were candidates for final multivariable models created using backward removal techniques and confirmed with forward addition techniques.

Studies used for advanced testing (eg, cystoscopy) were reported using summary statistics to describe the frequency with which testing was performed and the frequency with which it changed clinical care. Because of an overall low identified impact on clinical care, we ultimately summarized the specific ways in which clinical care was changed for each advanced study and categorized this based on the results.

Preventive strategies were identified based on the time of initiation: before or after consultation with urogynecology. A separate regression was performed to see if culture-proven rUTI status affected the use of preventive strategies. We did not find it feasible to compare those receiving preventive therapy with those who were not receiving preventive therapy because we felt this would be an unequal comparison (ie, in practice, we tend to initiate preventive therapy only in women who meet the criteria and, thus, we would be potentially selecting a more severe group for preventive therapy) and could overestimate the rate of UTI in the preventive therapy group when compared with those not receiving prevent (eg, those not receiving preventive therapy would be much less likely to get a UTI during follow-up because they likely did not have rUTI at consultation, so although preventive therapy would reduce UTI [ie, from 3 UTI/year to 1 UTI/year], it could still appear higher as compared with no preventive therapy [1 UTI/year on preventive vs 0 UTI/year on nothing]). We had planned a priori to determine which preventive strategies best reduced UTI incidence (ie, to see how much each reduced UTI relative the other preventive measures), but a lower than expected rate of UTI during follow-up precluded this analysis. Additional analyses to determine which variables affected rates of UTI were likewise not performed because of the low rate of UTI encountered.

RESULTS

A total of 600 women were included, of whom 193 (33%) met the criteria for culture-proven rUTI at the time of their urogynecology consult, with an additional 30 (5%) meeting the criteria during follow-up. When comparing women who met the criteria for culture-proven rUTI with women who did not, baseline demographics were similar except that women who did meet the criteria were older, more likely to be postmenopausal, status posthysterectomy, have a history of pelvic irradiation and gynecologic cancer, and were less likely to be currently sexually active ($P < 0.05$ for all; Table 1). Urinary symptoms were similar between women who met the criteria for culture-proven rUTI and women who did not. The most commonly reported UTI symptoms included

TABLE 1. Baseline Demographics

Variable	Met Culture-Proven rUTI Criteria	Did Not Meet Culture-Proven rUTI Criteria	*P*
Age, y	64 ± 17	56 ± 18	<0.001*
Race			0.069
White	192 (86)	307 (84)	
African American	8 (4)	30 (8)	
Asian	5 (2)	10 (3)	
Other	18 (8)	19 (5)	
Hispanic ethnicity	18 (8)	30 (9)	0.739
Body mass index, kg/m^2	28 ± 7	28 ± 8	0.745*
Postmenopausal	179 (81)	216 (62)	<0.001†
Hormone therapy	60 (27)	97 (27)	0.915
Systemic (oral/ transdermal)	34 (15)	70 (19)	0.231
Vaginal	30 (14)	30 (8)	0.041
Tobacco use			0.460
Never	149 (69)	255 (71)	
Prior	57 (26)	92 (26)	
Current	11 (5)	11 (3)	
Currently sexually active	89 (42)	195 (56)	0.001
Surgical history			
Hysterectomy	100 (45)	110 (30)	<0.001
Pelvic organ prolapse surgery	19 (8)	33 (9)	0.820
Procedure for stress incontinence	22 (10)	33 (9)	0.734
Surgery for OAB	5 (2)	0 (0)	0.007
Medical history			
Diabetes	33 (15)	53 (15)	0.916
Hypertension	88 (40)	137 (37)	0.623
Diuretic use	46 (20)	66 (18)	0.436
Immunosuppression/ chronic steroid use	13 (6)	17 (5)	0.526
Pelvic irradiation	5 (2)	0 (0)	0.008
Breast cancer	18 (8)	25 (7)	0.574
Gynecologic cancer	8 (4)	4 (1)	0.066
Chronic malabsorption	1 (0.4)	1 (0.3)	1.00
Urinary symptoms			
Daily voids	7 ± 3	8 ± 4	0.218*
Nocturia >2 times per night	67 (44)	64 (28)	0.002
Postvoid residual >100 mL	31 (16)	40 (12)	0.180
OAB medication use	27 (12)	43 (12)	0.834
Urinary incontinence	124 (56)	203 (56)	0.926
Urgency urinary incontinence	40 (32)	48 (24)	0.088
Stress urinary incontinence	20 (16)	52 (26)	0.045
Mixed urinary incontinence	56 (45)	103 (51)	0.328
Accidental bowel leakage	27 (12)	40 (11)	0.226
UTI symptoms			
Urgency	92 (41)	166 (45)	0.331
Frequency	116 (52)	183 (50)	0.635
Dysuria	131 (59)	146 (40)	<0.001
Malodorous urine	26 (12)	17 (5)	0.002
Other	67 (30)	94 (26)	0.249
Asymptomatic	9 (4)	7 (2)	0.124

Data reported as n (%) or mean ± SD. *P* values calculated from χ^2 test unless otherwise noted.

*Student *t* test.

†Fisher exact test.

OAB, overactive bladder; rUTI, recurrent urinary tract infection; UTI, urinary tract infection.

frequency, dysuria, and urgency, with only 7% of women reporting malodorous urine (Table 1). After initial consult, 426 women (71%) had at least 1 follow-up visit with a median of 179 days (interquartile range [IQR], 44–362 days) of follow-up.

A total of 234 women (39%) underwent advanced testing at some point in their care, with cystoscopy and CT being the most commonly performed tests (Table 2). In total, only 21 of the 234 women undergoing advanced testing (9%) had results that changed clinical care. Of those 21 women, the advanced testing results that changed clinical care were as follows: cystoscopy found 1 colovesical fistula, 1 bladder mesh erosion, and 1 bladder mass (benign pathology on biopsy); CT scan found 7 nonobstructing renal stones, 3 renal cysts, and 1 hydronephrosis; renal ultrasonography found 1 renal stone, 4 renal cysts, 1 hydronephrosis, and 1 urinary retention (postvoid residual volume was 560 mL at baseline consultation). There were no changes in clinical care because of magnetic resonance imaging or X-ray test results.

Use of preventive therapy is presented in Table 3. We found that prior to initial consultation, a median of 0 (IQR, 0–1) preventive therapies were used, with 141 women (23.5%) using 1, 42 (7.0%) using 2, 11 (1.8%) using 3, and 9 (1.5%) using 4 or more. We found that after the initial consultation a median of 1 (IQR, 1–2) preventive therapy was used, with 242 women (40.3%) using 1 strategy, 87 (14.3%) using 2, 47 (7.8%) using 3, and 22 (3.7%) using 4 or more. The documented use of preventive therapies showed a statistically significant increase following the initial urogynecology visit ($P < 0.001$ for all therapies) with the use of vaginal estrogen increasing more than 3-fold from 14% to 47%. When looking closer at vaginal estrogen use, we found a significantly lower rate of usage in women with prior history of breast cancer compared with others (39% vs 64%, $P = 0.032$), but there was no significant difference in estrogen use in women with a prior history of gynecologic cancer compared with others (63% vs 63%, $P = 0.649$).

A total of 266 women (44%) were treated for UTI empirically or based on positive urine culture during follow-up. The median number of days to first UTI following urogynecology consult was 33 (IQR, 1–157). Of the 216 positive urine cultures for the first postconsult UTI, most were *Escherichia coli* (n = 136, 57%) and *Klebsiella* (n = 33, 14%) and were usually treated with nitrofurantoin (n = 130, 52%), followed by trimethoprim-sulfamethoxazole (n = 47, 19%) or a fluoroquinolone (n = 39, 16%). By the third postconsult UTI, 24 women (36%) were treated with nitrofurantoin, and 15 (21%) received a fluoroquinolone. Of the 266 women treated for a UTI during follow-up, 131 (49%) had a second follow-up UTI, 71 (27%) had a third, 44 (17%) had a fourth, and 27 (10%) had a fifth.

When comparing women who met the criteria for culture- proven UTI either at the initial visit (n = 193, 33%)

TABLE 2. Advanced Testing Utilization and Outcomes

Test Type	Test Performed	Results Changed Clinical Care
Cystoscopy	173/598 (29%)	3/173 (2%)
CT scan	102/598 (17%)	11/102 (11%)
Renal US	77/597 (13%)	7/77 (9%)
MRI	15/598 (3%)	0/15 (0%)
X-ray	1/598 (0%)	0/1 (0%)

CT, computed tomography; MRI, magnetic resonance imaging; US, ultrasonography.

or follow-up (n = 30, 5%) and those who did not in adjusted analyses, we found that women meeting the criteria for culture-proven rUTI were significantly more likely to be older, report dysuria or malodorous urine, and have a history of gynecologic cancer (Table 4). Logistic regression showed women with culture-proven rUTI were not more likely to receive preventive treatments before urogynecology consult (39% vs 32%; odds ratio [OR], 1.37; 95% confidence interval [CI], 0.97–1.95) but were more likely to after urogynecology consult (85% vs 65%; OR, 3.06; 95% CI, 2.05–4.55).

DISCUSSION

Although rUTI is a common indication for referral to a subspecialist, we found that only 33% of women referred to urogynecology for this condition met the diagnostic criteria.[7] Culture-proven rUTI was more common in older women and those with a prior history of gynecologic cancer.

The prevalence of rUTI in the general population is variable because of different diagnostic criteria. Previous studies have shown that acute cystitis occurs in 50–80% of women, and of these, 20–44% will have a recurrence.[1,2] The overlap of chronic conditions (such as urinary incontinence, urinary urgency, vaginal atrophy, and urinary frequency) may confound the clinical picture in a urogynecologic population.[2,13] Several studies have demonstrated that when dysuria is a presenting symptom, there is a higher probability of a UTI diagnosis.[14,15] Our study supports these findings. Based on these data, utilizing dysuria as a screening tool in women with UTI complaints to avoid overtreatment should be further explored.

We found a history of gynecologic cancer to be a risk factor for culture-proven rUTI. Vaginal estrogen is considered safe in this population,[16] and we found no difference seen in use of vaginal estrogen for women with history of gynecologic cancer when compared with others in this study population. It is possible that a history of gynecologic malignancy may be a confounder for some other UTI risk factor, such as pelvic irradiation. There is limited literature on UTI during pelvic radiation therapy in women,[17,18] and more research is needed to determine rUTI rates in cancer survivors.

We did find it interesting that on unadjusted analyses, SUI was less likely to be seen with culture-proven rUTI, whereas there was no significant difference for urgency urinary incontinence (Table 1). While SUI had a lower P value than a history of gynecologic cancer on univariate analysis, it was not included in the final regression. For the final regression, all variables with $P < 0.2$ were candidates for inclusion (Table 4). This approach allows for variables approaching significance on univariable analyses to be included in the final regression because these variables might become significant once adjusting for confounders. We used forward addition and backward removal techniques to create a final model that incorporated as many of these variables with $P < 0.2$ as possible while generating a model that best accounted for the inherent variability within the data. Once other confounders were included in this final regression, we found SUI was not a significant predictor of culture-proven rUTI and was not included in the final model using these techniques.

The American Urologic Association, Canadian Urologic Association, and Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (AUA/CUA/SUFU) consensus guidelines direct clinicians to consider upper tract imaging and cystoscopy in women with rUTI if there is suspicion of a complicating factor, but caution clinicians to avoid routinely obtaining this workup.[7] Our study supports the AUA/CUA/SUFU consensus guidelines. In line with these recommendations, we found that advanced testing rarely changed clinical care. When advanced testing did uncover additional diagnoses, the most common result was a referral to urology. Most of the significant diagnoses (predominantly nonobstructive stones) did not require further management, and referrals to urology might carry unintended additional health care costs.

Preventive strategies vary, and the efficacy of preventive therapy depends on patient adherence, which can be limited based on the cost of medications or concerns regarding adverse effects of a preventive therapy. We did not attempt to determine or calculate the efficacy of any prophylactic measures as we were not able to uniformly assess whether the patients had taken the prophylactic therapy as recommended because of the retrospective design and our reliance on records reporting the "real world" usage of medications by patients without further verification or delineation of exact dosages/brands. Use of vaginal estrogen has been found to decrease UTIs among postmenopausal women when compared with placebo and is recommended as a preventive therapy in the American Urogynecologic Society and AUA/CUA/SUFU guidelines for perimenopausal and postmenopausal women.[7,8,19] In line with guidelines, vaginal estrogen and antibiotic therapy (prophylactic or postcoital) were the most common choices utilized. Our finding of a 3-fold increase in the documented use of vaginal estrogen following a urogynecology consult reveals an opportunity to educate health care providers regarding the safety and efficacy of vaginal estrogen for the vast majority of women, including most women with a history of estrogen receptor–positive breast cancer or venous thromboembolism,[20,21] as patients and even referring providers can be hesitant to utilize vaginal estrogen due to concerns about the potential adverse effects that are associated with systemic hormone therapy.

Strengths of our study include its large sample size from regionally diverse sites and use of clear widely accepted criteria for

TABLE 3. Use of Preventive Strategies

Preventive Strategy	Started Prior to Consult	Started After Consult
Vaginal estrogen	82 (14)	281 (47)
Cranberry	54 (9)	106 (18)
Probiotics	48 (8)	58 (10)
Prophylactic antibiotics	45 (8)	59 (10)
Postcoital antibiotics	32 (5)	28 (5)
Methenamine (Hiprex)	12 (2)	62 (10)
D-Mannose	18 (3)	41 (7)
Other	6 (1)	22 (4)

Data reported as n (%). Denominator (total N) = 600 for all.

TABLE 4. Multivariable Logistic Regression for Culture-Proven Recurrent Urinary Tract Infection

	Unadjusted		Adjusted	
Variable	**OR**	**95% CI**	**OR**	**95% CI**
Dysuria	2.15	1.53–3.01	2.27	1.57–3.27
Malodorous urine	2.71	1.44–5.12	2.96	1.47–5.94
Age (per each decade)	1.34	1.22–1.48	1.34	1.22–1.48
History of gynecologic cancer	3.37	1.00–11.32	4.07	1.02–16.25

Categorical variables included in the multivariable logistic regression analysis included the following: race, sexual activity, prior hysterectomy, hormone therapy, dysuria, malodorous urine, and gynecologic cancer.

CI, confidence interval; OR, odds ratio.

culture-proven rUTI diagnostic criteria (ie, ≥2 culture-proven UTI in 6 months or ≥3 culture-proven UTI in 1 year). We aimed to reflect the true cohort of women seen by urogynecologists for rUTI evaluation, so we used inclusion criteria that included patients meeting the aforementioned definition for culture-proven rUTI, as well as patients referred for rUTI and patients reporting 2 or more UTIs in 6 months or 3 or more UTIs in 1 year. Our results are applicable to a broad clinical population that reflects the patients seen in practice, and as a result, our data can be used by health care providers when counseling women with frequent UTI symptoms to provide reassurance in discussing the low rate of actual rUTI, as well as the low rate of clinically significant findings on advanced testing.

We acknowledge the weaknesses inherent to a retrospective study, including selection bias and recall bias. We recognize that urogynecology referrals are placed for a variety of reasons and can be for multiple issues (eg, patients may be referred for prolapse or incontinence who also have or complain of rUTI). We feel confident that in this retrospective study we were able to adequately capture patients with secondary complaints of rUTI as all sites routinely screened for UTI in their new patient packet or initial intake process. As one site was required to perform the initial chart review electronically, it is possible that some potential patients were inadvertently excluded. This site's number of included patients was similar to that seen from the other sites, indicating that inadvertent exclusion was likely rare. To optimize complete collection of study data, including information on preventive strategies, we also utilized chart review of the current medications and additional health care provider notes. All sites included in this study were tertiary academic centers utilizing electronic medical record systems, and as these sites are regional medical centers, the vast majority of referrals have their primary care provider and/or gynecologist within the electronic medical record system where results would be available to review using our retrospective design. We recognize we likely did not capture every urine culture performed outside our health systems. This limitation was minimized by that fact that our practices routinely direct patients to obtain cultures within our health systems and, if unable, to fax/submit any results performed at outside facilities and by including reported UTI treatment as well while acknowledging that this may not always reflect a culture-proven UTI.

It is important to keep in mind when interpreting these results that, although most women followed up after their initial evaluation, we followed women up to a maximum of 2 years, with the median follow-up for the population being 179 days (IQR, 44–362 days). It is also important to acknowledge that, despite our large sample size, the paucity of patients whose clinical care was affected by advanced testing precluded regression analysis to identify patients more likely to benefit from advanced testing. Further research is needed to identify who should undergo advanced testing and to determine which, if any, preventive strategy is the most effective.

Although rUTI continues to be a prevalent condition affecting the quality of life for many women, a minority of those referred for urogynecology consultation met the diagnostic criteria for culture-proven rUTI in this study. We believe this discrepancy reveals an opportunity for educating referring health care providers and patients on the safety of vaginal estrogen for most women, the diagnostic criteria for UTI and rUTI for patients with UTI symptoms, and the lack of a need to treat asymptomatic bacteriuria to improve antibiotic stewardship. Increased understanding of rUTIs and their initial management options is likely to decrease some of the health care burden of rUTI by decreasing unnecessary treatment and unnecessary subspecialty referrals.

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This document reflects clinical and scientific advances as of the date issued and is subject to change. The information should not be construed as dictating an exclusive course of treatment or procedure to be followed. Its content is not intended to be a substitute for professional medical judgment, diagnosis, or treatment. The ultimate judgment regarding any specific procedure or treatment is to be made by the physician.

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